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Notes on North American Willows, with a description of new or imperfectly known species. I.

M. S. BEBB.

Since the publication of the Flora of California, much additional knowledge has been gained concerning American glaucoid willows. The genuine Glaucæ, in their extension southward within the boundary of the United States, are restricted to the Rocky mountains and Wasatch range—in a word, keep east of the Great Basin, with this exception, that on some of the highest peaks of the Sierra Nevada, at altitudes varying from 10,000 to 12,000 feet, a very peculiar form of Salix (glauca) villosa was collected years ago, on Mt. Hoffman and Wood's Peak by Prof. Brewer, on Mt. Whitney by Prof. Rothrock. Upon the evidence afforded by these three collections this species was given a place in the Flora of California, and although ten years have since elapsed they still remain, unsupported by further findings, to attest the occurrence of any form of S. glauca west of the Great Basin. Mr. Watson's no. 1099 (Bot. King Exped. p. 325), from the East Humboldt mountains of Nevada, alt. 9,000 feet, is the same plant.

Taking now the allied forms of the Sierra Nevada and Cascade ranges, we have, first, the well known S. Californica, more clearly distinguished from all forms of the Glaucæ by its glandular-serrulate leaves, green both sides, entire style and entire erect stigmas, than was at first believed. This, so far as known, is peculiar to the Sierra Nevada, and not found beyond the limits of the state for which it is named. Going northward, we next come to a species of the Cascades and Blue mountains, not heretofore recognized, sharing with S. Californica the characters above mentioned, but adding to them several very striking ones verging toward the Cordatæ, viz.: glabrous capsules, shorter style and stigma and very conspicuous stipules. This species finds its easternmost limit on some rugged peaks near Snake river, part of the Idaho system. Finally, this, in turn, is replaced on Mt. Adams by still another species exhibiting a still further approach to the Cordatæ, as I have indicated in the description. This ranges from Mt. Adams far northward,

spreading over to the Rocky mountains in Montana, and approximating in character several very diverse northern species.

The geographical distribution of these species in connection with their order of sequence in natural affinity is curious. Even in British Columbia, before the boundary of the United States is reached, it is observed that the Rocky mountains mark the western limit of S. villosa. Prof. Macoun says, "under a number of forms this variety extends from the eastern side of the Rocky mountains at Morley to the summit of the Selkirks (51°) and northwestward"[1]—that is, along the trend of the mountains. It follows the mountains southward also, spreads over the Wasatch range, and then skipping from peak to peak, as it were, finds a rare lodgment on a few of the highest summits of the Sierra Nevada. Has this any significance, in connection with the strange fact that in the group which we have been considering as restricted to the mountains west of the Great Basin, a group intermediate in character between the Glaucæ and the Cordatæ, *it is at the south that the variation toward S. glauca occurs and at the north the transition toward S. cordata?*

Taking S. commutata as combining in the most remarkable manner glauca-like and cordata-like characteristics, we must apparently trace its connection with S. glauca southward around the southern extremity of, or by leaps across, the Great Basin, and thence northward along the Rocky mountains to Alaska, while directly northward there is a manifest fading out of glaucoid characteristics and accession of those leading toward S. cordata. And this notwithstanding the fact that genuine S. glauca is found on the coast of Alaska. Between Oregon and Alaska I do not know of a willow so nearly allied to S. glauca as this plant of the Blue mountains and the Cascades.

S. commutata, n. sp. A diffuse alpine shrub of variable stature, commonly 3 to 4 feet in height, in sheltered localities 8 to 10 feet, often much dwarfed by altitude and exposure: leaves broadly oblanceolate or oblong, abruptly pointed, cuspidate, tapering toward the roundish base, at first covered more or less with a dense silky tomentum, downy even when fully grown; older and lower leaves becoming smooth, green both sides (not glaucous beneath), margin entire or (under a lens) minutely glandular-serrulate; leaves of sterile shoots ample, 3 to 4 inches long, varying to cordate-ovate, thinnish

[1] Cat. Canadian Plants, p. 449.

in texture; stipules large, ovate, glandular-serrate: aments on stout leafy peduncles with 4 to 7 ovate or oblanceolate leaves, erect, densely flowered, an inch long; fertile in frui 2 inches, compact, cylindrical; scale thin, pale or brownish, obtuse, woolly; capsule ovate-conical, glabrous, greenish or rufescent; pedicel pubescent, 2 to 3 times the length of the nectary; style medium, stigmas small, erect, entire.

Var. **sericea.** Young leaves densely white tomentose, entire.

Var. **denudata.** Young leaves smooth or nearly so, more distinctly serrulate.

Var. **puberula.** Capsule thinly puberulous. Transition to S. Californica.

Alpine bogs, Eagle Creek mountains near Snake river, in great abundance, also in the Blue mountains, where it appears to be limited to a small district, *Cusick;* Cascade Mts., Washington Territory, alt. 6,400 ft., *Tweedy.* Var. *sericea*, moraines near the snow line on the north side of Mt. Hood, *Howell, Henderson.* Var. *denudata*, Eagle creek meadows, *Cusick;* Cascade Mts., Washington Territory, *Tweedy.*

In its glabrous rufescent capsules, entire style and short erect entire stigmas, and in its large serrulate stipules this species obviously resembles S. cordata; while on the other hand the whole habit of the plant, the broad softly tomentose subentire leaves, the stout leafy peduncles and subsessile capsules are like S. glauca.

S. conjuncta, n. sp. Leaves of the flowering branches elliptic or obovate, subacute, 1 to 1½ in. long; leaves of the sterile branches ample, 2 to 4 in. long, 1 to 2 in. wide, ovate-lanceolate, cuspidate-acuminate, attenuate or rounded at base; stipules large, ovate, acute; all glabrous or at first thinly overspread on the upper surface with evanescent floccose hairs, at length rigid, scarcely paler or rarely subglaucous beneath, young drying black, margins finely and evenly crenate-serrulate: aments borne on stout leafy peduncles, large, thick, 1 to 2 in. long; fertile becoming rather loose and flexuose in fruit (lengthening sometimes to 3 in.); scale acutish, dark, villous with crisp hairs, sometimes densely or again thinly hairy or quite naked at the tip; capsule glabrous, rostrate from an ovate base; pedicel 3 times the length of the nectary; style medium or elongated, about equaling the pedicel, stigmas short, entire or bifid.

In wet meadows and along alpine rivulets, Mt. Adams, Washington Territory, *Parry, Howell, Suksdorf, Henderson;* Cascade Mts., alt. 5,500 ft., *Tweedy;* Bald mountain, S. W. Montana, alt. 7–8,000 ft., *Watson;* summit

of S. Kootanie pass, B. C., *Dawson;* Kicking Horse pass and on the Selkirks, *Macoun;* near Alaska, *Dawson;* Kodiak, *Kellogg.*

This combines characteristics of several diverse species, while differing from each in turn. It has been mistaken for S. Barrattiana, especially the form with thick woolly aments, but it differs in the smooth leaves, aments peduncled, capsules glabrous: accords in some respects very nearly with the character assigned S. Barclayi—a species of the Alaskan coast—but that has a much longer style and long slender reflexed stigmas: aments as in S. cordata, but leaves broader and shorter, drying black, capsules shorter pediceled; leaves, particularly of the flowering branches, like S. montana of the Rocky mountains, but that has closely sessile aments. The wide range over which this species preserves its character is a guarantee of its validity. On Mt. Adams it appears to replace, as it were, S. commutata, from which it is distinguished by the darker green leaves, often subglaucous beneath, distinctly crenate serrate, smooth (as in S. phylicifolia), drying black, aments more loosely flowered, capsules rostrate, perfectly smooth even to the pedicel, stigmas often bifid.

Rockford, Ill.

Some undescribed Hepaticæ from California.

LUCIEN M. UNDERWOOD.

(WITH PLATES III—VI.)

Among botanical collectors on the Pacific coast, Dr. Henry N. Bolander has done more than all others to bring to light new forms of Hepaticæ, and his name is inseparably connected with species belonging to several genera. Much of the material which he collected was sent to Mr. Austin, who described numerous species from California. Some of his earlier collections, however, were sent to Dr. C. Gottsche in Altona, near Hamburg; among these are some that have never been described; camera tracings of four of these have been at Cambridge for some time. With the kind permission of both Dr. Gottsche and Dr. Watson I am able to publish these plates with the necessary descriptions, as well as the description of a fifth which is not represented in any of the larger herbaria of the country, but of which Dr. Gottsche has generously sent both specimens and a Latin diagnosis. The fact that these species have remained undescribed for twenty-two years is significant, as is also the fact that, so far as known, only one of the species has been collected a sec-

ond time. The latter circumstance may doubtless be explained on the ground that the original stations are in regions less visited and accessible. There is every reason to believe that many interesting species will be discovered in California, particularly in the mountain regions, and doubtless several of the species now accredited to Oregon alone will be found in northern California.

Of the species described below, four are of the genus Jungermania as limited by modern writers, while the fifth is of the thallose genus Grimaldia.

Jungermania Danicola Gottsche MS. Autoicous: stems small, ascending, simple, sparingly radiculose: leaves rotund, increasing upward, semi-amplexicaul, rather distant, entire: amphigastria wanting: involucral leaves similar to those of the stem: inner involucre[1] obovate, the mouth more or less irregularly bilabiate.

Hab. In ditches, Mt. Dana, California, 10,000 ft., Sept., 1866 (*Bolander*).

PLATE III—I. Plant showing antheridia and archegonia. II. Plant showing young archegonia and a single involucre.[1] III. Inner involucre from the side. All magnified 62 diameters.

Jungermania rubra Gottsche MS. Stems short, creeping, densely radiculose to the apex: leaves subimbricate, bright red, ovate-rotund, oblique, semi-amplexicaul, slightly decurrent dorsally, entire: amphigastria wanting: involucral leaves larger than those of the stem, with thickened margins: inner involucre quadrangular-ovate, the mouth short mucronate, denticulate, ferruginous purple especially toward the apex and the angles: antheridia unknown.

Hab. On metamorphic sandstone, Mendocino City, California (*Bolander*); cliffs near the sea, Santa Cruz, California (*Farlow*).

PLATE IV—Figures all magnified 24 diameters.

Jungermania Bolanderi Gottsche MS. Stems simple ascending, innovating from beneath the involucres: leaves concave, ovate-rotund, entire, closely imbricate, those of the innovations more remote and decurrent, plane, slightly undulate: amphigastria wanting: involucral leaves larger than those of the stem, otherwise similar: inner involucre cylindric-ovate, the mouth entire or slightly denticulate: male plant unknown.

Hab. In ditches, Mt. Dana, California, 10,000 ft., Sept., 1866 (*Bolander*).

PLATE V—I, II, female plants; III–VI, inner involucres; VII, inno-

[1] I follow the nomenclature of my "Descriptive Catalog," and use this term in place of *perianth*.

vating branch; VIII, involucral leaves. All the figures are magnified 17 diameters.

Jungermania Muelleri, var. **Danaënsis** Gottsche MS. Stems 1–3 cm. long, mostly simple, creeping, ascending at apex, densely radiculose: leaves semi-vertical, irregularly quadrate-rotund, more or less emarginate-bilobed or rarely trilobed, the lobes rounded, the sinus obtuse or rarely acute; areolation mostly uniform, moderately close: amphigastria wanting: involucral leaves half as large as those of the stem, acute or acuminate, more or less irregularly cleft or serrate: inner involucre obovate, irregularly fissured, the mouth multidenticulate: male plant unknown.

Hab. In ditches, Mt. Dana, California, 10,000 ft., Sept., 1866 (*Bolander*).

PLATE VI—I–V, various portions of plant; VI, XI, XII, inner involucres in various positions; VII–X, XIII, XIV, XVI, stem leaves; XV, involucral leaves. All the figures are magnified 20 diameters.

From *J. Muelleri* it is distinguished (1) by the absence of amphigastria, (2) the shape of the inner involucre, and (3) its smaller involucral leaves—characters almost sufficient to be regarded as specific; it may finally take rank as a distinct species. Specimens in the Harvard herbarium are labeled "*J. Danaensis, vel J. Muelleri,* var. *Danaensis.*"

Grimaldia Californica Gottsche MS.[2] Thallus 1–3 cm. long, 2–4 mm. wide, linear-spatulate, with obcordate innovations, thickly covered underneath with purple scales which extend beyond the margin: peduncles 2–2.5 cm. long, reddish at base, green above, arising laterally from the innovations: carpocephalum globose-conoidal, purplish, 1–4-fruited: capsule reddish; spores black-purple, crenulate; elaters purple.

Hab. Yosemite Valley, California, on rocks in the spray of Bridal Veil Fall, June, 1866 (*Bolander*).

Syracuse University, Syracuse, N. Y.

[2] With Dr. Gottsche's letter came the following diagnosis: "Capsula (colore vini rubri) purpurascente (luce pervia); sporis nigro-purpureis, margine subtiliter crenulatis ($\frac{200}{1}$); elateribus purpureis (et fibris et utriculo); pedunculus basi rubescente squamis rubro purpureis pallidioribus ornatus, apice viridis ex innovationum cordiformium parvarum lateralium sinu exsurgit; et receptaculum globoso-conicum 1-3-4carpum habet."

Notes on the Flora of James Bay.

JAMES M. MACOUN.

To the botanist especially interested in the distribution of plants there is perhaps no district which affords better opportunities than James bay for noting the interchange of species. If the coast line be followed, the change is so gradual as one proceeds northward, that a thorough examination day by day of the flora a mile inland from the coast will result in the discovery of but few species that had not been observed before, but it will be seen that the more southern forms are gradually disappearing; along the coast itself northern species become more and more abundant, while the islands a few miles from the shore present a flora that is essentially arctic. When one remembers that many days after the snow has disappeared from the woods huge masses of ice lie piled along the shore, and that long after these have been melted by the warm rays of the June sun other masses, driven by wind and current from the far north, are stranded upon the islands of the bay, it is not difficult to account for the great difference between the species growing on the mainland and on the islands, although the latitude and elevation be the same.

A general description of the flora of James bay would be impossible, as, while the west coast is low and bordered by marshes, the east coast is rocky and much higher, and the immense mud flats of the western and southern shores are entirely wanting. Although the cold currents from the north enter the bay along the western shore, the water is so shallow that floating icebergs, even of small size, ground many miles from land, while on the eastern side of the bay the water is very deep, and the ice is moved here and there by every change of tide. The plants found along the western coast are simply those one expects to find throughout the wooded country of the north, and I shall confine myself to a brief mention of the more interesting species found on the mainland and islands of the eastern portion of the bay, and shall not attempt a general description of its flora, but will take the course northward that was followed last season, and note the more important changes as they occur.

Moose Factory, situated about eight miles from the mouth of Moose river, in lat. 51° 18′, may be taken as a starting point. Were it not that the number of species is smaller, no differ-

ence could be seen between the plants growing immediately about this place and those found throughout northern Ontario, and upon descending to the mouth of the river no species were seen that are not common along the Atlantic coast. Sailing in a northeasterly direction a distance of about sixty miles from Moose river, Charlton island is reached, from which the mainland may be seen both toward the south and east, and a very perceptible change is at once noticeable in the character of the flora. The first flower that meets the eye on stepping ashore is *Chrysanthemum arcticum* L. in profusion just below high-water mark, and a few yards higher up *Silene acaulis* L. and *Dryas octopetala* L. var. *integrifolia* Ch. & Scl. growing in tufts side by side, near them *Pedicularis flammea* L., and *Botrychium Lunaria* Swartz. The last mentioned species is very common on all the islands of James bay. On the wooded portion of Charlton island the species are almost identical with those noted at Moose Factory, but on the higher almost barren ground of the interior but few species grow, and these are mostly northern, among them *Campanula rotundifolia* L. var. *arctica* Lange, generally with white flowers, the beautiful pink-flowered form of *Achillæa millefolium* L., *Potentilla maculata* Pour., *Salix arctica* Pall., *Salix reticulata* L. and *Poa cenisia* All. A peculiar form of *Linum perenne* L. with white flowers is common on this and the other islands in James bay. I have never seen a blue-flowered specimen growing anywhere near James bay or Hudson bay, although I have collected this form as far north as lat. 56° on the west coast of Hudson bay; in habit, also, it is quite distinct from the western form of this species which I have; growing in sand just above high-water mark, it stretches itself along the ground, but is never erect as on the plains.

Crossing to the mainland and sailing north about 140 miles, Big river (lat. 53° 50′) is reached, and here a number of interesting species were collected, among them *Festuca ovina* L. var. *brevifolia* Wats., *Glyceria maritima* Wahl., *Deyeuxia Langsdorffii* Kunth, *Phleum alpinum* L., *Hierochloa alpina* R. & S., *Deschampsia atropurpurea* Scheele. var. *minor* Vasey (new var.), and a new species of Deyeuxia not yet described. In the pond along the borders of which this last mentioned species grew *Sparganium hyperboreum* Loest. was very abundant, although not seen in any other locality. *Juncus filiformis* L., *J. Balticus* Deth. and *J. triglumis* L. were all very common here, and *Luzula arcuata* Meyer and

L. spicata Desv. were by no means rare. The sand and gravel bars at the mouth of the river were covered with *Chrysanthemum arcticum* L. and *Matricaria inodora* L. The only ferns growing in this locality were *Botrychium Lunaria* Swartz, *B. ternatum* Swartz and *Aspidium spinulosum* Swartz, var. *dilatatum* Hornm.

About sixty miles southwest of the mouth of Big river lie two islands, "The Twins" (between lat. 53° 5′ and 53° 20′), each about thirty miles in circumference. These islands are quite barren, with the exception of a few stunted spruce trees. On the northern island there are perhaps not more than a score of these, and none of them are above six feet in height. Although low and spreading, they were of mature age and covered with cones, settling beyond a doubt that *Picea alba* Link goes farther north than *P. nigra* Link, on James bay at least. Around all ponds on these islands *Salix glauca* L. was very abundant, and on the north Twin island specimens of a new willow were collected which has been described by Mr. Bebb. While all the northern plants that had been seen before were found on these islands, many additional species were noted, principally endogens. *Carex rotundata* Wahl., *C. microglochin* Wahl., *C. rariflora* Smith and *C. nardina* Fries were the most interesting carices collected. *Potamogeton pectinatus* L. was common in all ponds, and about a dozen specimens in all of the rare *P. rutilus* Wolfg. were secured, one or two at a time. The usual form of *Epilobium latifolium* L. is quite common all around the bay, and on the south Twin island three specimens were collected with much larger flowers of a beautiful cream color, and with a delicate but perceptible odor. *Bartsia alpina* L., *Pedicularis Lapponica* L., *Erigeron uniflorus* L., *Arabis humifusa* var. *pubescens* Wat. and *Stellaria longipes* Goldie var. *Edwardsii* T. & G. were collected together on the first dry ground above high-water mark, while in the interior of the islands *Saxifraga Hirculus* L., *Saxifraga aizoides* L., *Pedicularis hirsuta* L. and *Luzula comosa* Meyer were frequently met with. On a grassy bank, by the only spring noticed on either island, grew *Veronica alpina* L., *Sibbaldia procumbens* L., *Ranunculus affinis* R. Br. var. *validus* Gray and *Parnassia Kotzebuei* Cham. & Sch., and these species were not seen in any other locality.

Although the exploration was carried on as far north as Cape Jones in lat. 54° 30′, no species were seen there that did not grow on the islands further south.

Of the three hundred or more species of flowering plants found growing around James bay I have mentioned only those that I considered the most interesting, but I do not doubt that future explorations will add many additional species to the list.

Ottawa, Canada.

Jacob Whitman Bailey.[1]

STANLEY COULTER.

No sketch of North American botany would be complete were the name of Professor Bailey omitted. The record of his life and work is a record not only of interest, but of inspiration and encouragement to all botanists, in that it shows how great results may be attained, in spite of what to many might have seemed insuperable obstacles.

Jacob Whitman Bailey was born in the old town of Ward (now Auburn), Worcester county, Mass., on the 29th of April, 1811. In his boyhood he gave evidence of a taste for scientific studies, leaving the companionship and sports of those of his own age for solitary wanderings through the woods—not the mere purposeless excursions of boys, but for the collection of plants and minerals, which he afterward classified. This scientific taste seems to have come to him by direct inheritance from both branches of the ancestral line, his great-grandmother Whitman being especially distinguished for her love of botany and astronomy. Even as a boy was manifested that rare and beautiful modesty which characterized his after life. He worked and studied that he might satisfy himself, not that he might distinguish himself or surpass his schoolmates. Owing to the limited resources of the family, he was, at the age of twelve, placed in a circulating library and book store in Providence. In this position he found much time for self-improvement, devoting himself especially to the study of mineralogy and conchology. So earnestly studious was he that he attracted the attention of Mr. John Kingsberry, long secretary of Brown University, who, knowing the difficulties under which he was laboring, invited him to spend certain evenings of the week at his home for the purpose of studying Latin. The remaining

[1] The data for this sketch were furnished by Prof. W. W. Bailey, of Brown University from letters of his father in his possession and from his personal reminiscences.

evenings of the week the boy spent in the study of French with a French teacher. It is a little surprising to learn that he also found time to make a very considerable collection of shells and insects. This habit of making every moment of the day productive became even stronger as he grew in years, and serves to explain how he was able to accomplish what seemed to be impossibilities.

In July, 1828, he received an appointment as cadet at West Point, from which school he graduated fifth in his class in 1832.

After serving at various posts as second lieutenant of artillery, he was, in March, 1834, appointed assistant professor of chemistry at West Point, an occupation far more congenial to one of his studious tastes. In July, 1838, he writes to his brother, informing him of his appointment as professor in charge of the newly constituted department of chemistry, mineralogy and geology. This position he retained to the time of his death, the 27th of February, 1857.

Before passing to an examination of his scientific work, it is but proper to refer to the great tragedy of his life and that which cast a shadow over his later years. He was married in 1835 to Miss Maria Slaughter, of West View, Virginia, and from the glimpses of their after life which we have been permitted to have, the home thus founded must have been one of unusual happiness. In July, 1852, Prof. Bailey, his wife, his only daughter and son Whitman (Prof. W. W. Bailey) were passengers on the steamer Henry Clay, which was burned near Yonkers. When the fire broke out Prof. Bailey succeeded in lowering his wife and daughter into the water, and had just received from them assurances of their safety, when suddenly a cloud of smoke mingled with sheets of flame shut them from his view and they were lost. His son was saved almost as by miracle. Previous to this he had been subject to bronchial affections, and his exertions on this occasion, added to the bitterness of his bereavement, gave him a shock from which he never rallied.

Singularly modest, reserved in manner except to those to whom he had given his friendship, bright and sparkling in conversation with the few chosen ones, of rich poetic taste and fancy, strong in his hate of the wrong, tender and loving in his home—these were his personal traits, and these are traits that make rare men.

Among the earlier scientific passions of Prof. Bailey was that for botany, and throughout his life, even though the

duties of his chair would seem to have left but little time for outside work, he continued its study. Scarcely one of his sketches of his numerous exploring trips but that shows the hand of the trained and accurate botanist. But it was through his work with the microscope, and as a direct result of his knowledge and mastery of it, that he was to win for himself a distinctive place in the botanical world and become "the Ehrenberg of America."[2] The first purchase he made for himself as a boy was that of a microscope, and from that time a microscope was the constant companion of his journeys. His improvements of its mechanism, his suggestions as to its appliances, have placed all microscopists under obligations to him. His observations were characterized by accuracy and completeness, and his skill with the pencil, added to his habit of making copious notes, furnished him ample data for all subsequent papers.

In 1839 his work upon the diatoms commenced. He was led to this study by the appearance of an object in the field of his glass that he did not fully understand. His attention having been thus attracted, he devoted himself with wonderful zeal to a study of those life forms grouped under the general term infusoria, and soon added to this a study of the algæ, a branch requiring almost as much patience and microscopic skill as the former. When he commenced these studies nothing had been done in this country, and books could not be procured. Gradually, as he worked, he collected the literature of the subject, added to it the result of his own labors, became the active correspondent of Ehrenberg, Kützing, Agardh, and a score of others, and won the high position he holds in these lines of research.

In the pursuit of these studies materials were secured from all possible sources, and worked with astonishing fidelity and skill when we consider their quantity. His bequest to the Boston Society of Natural History included 550 slides, upon which were mounted over 3,000 objects, together with 32 portfolios of algæ, containing some 4,500 specimens.

Prof. Bailey also made a special study of raphides, the results of which were published in 1843 in *Silliman's Journal*, under the title, "On crystals which occur spontaneously formed in the tissues of plants," and are still authority upon the subject. In 1846 Prof. Bailey published in the same journal a paper "On the detection of spirally-dotted or scalariform ducts and other vegetable tissues in anthra-

[2] Dr. A. A. Gould in Proc. Bost. Soc. Nat. Hist. vol. VI, p. 174.

cite coal," which brought new honor to the unassuming worker. His papers are quite numerous, and are characterized by a terse and direct simplicity that evidences a complete mastery of the subject in hand. Dr. Gray says of them: "They are all clear, explicit and unpretending as they are thorough; and every one of them embodies some direct and positive contribution to science." The majority of these papers, being published in *Silliman's Journal*, are of such easy access that an extended notice of them in this place is unnecessary. Some of the more general sketches, such as the one entitled "Account of an excursion to Mount Katahdin, in Maine," serve to show the wide reach of his knowledge and the grace of his style to a greater degree, perhaps, than his more strictly scientific papers. Omitting all titles, except those pertaining more or less directly to botany, the following list will enable us to appreciate somewhat not only the character of his work, but his wonderful industry. Yet, to fully realize the magnitude of his achievements, it must be remembered that his was the work of breaking paths in hitherto untrodden regions; that he worked virtually without assistance, without literature, without appliances, save those his own ingenuity devised; that, while thus working, he was also filling with distinction his chair in the Military Academy at West Point, and making an equal fame in other branches of scientific research. In the Synoptical Flora, Dr. Gray calls him "The pioneer in microscopical research in the United States;" and yet, with all his duties, with all this new world to explore, he found leisure to draw hundreds of carefully finished sketches of knights and ladies, castles and palaces, for the amusement of his invalid son. The titles here given are taken from the catalogue of the Royal Society, and were furnished by his son, Prof. W. W. Bailey, of Brown University:

Account of an excursion to Mount Katahdin, in Maine.—*Silliman's Journal*, XXXII (1837), 20–34.

Observations on the vascular system of ferns and notice of a monstrous flower of Orchis spectabilis.—*Silliman's Journal*, XXXV (1839), 113–117.

On fossil infusoria discovered in peat earth at West Point, New York, with some notices of American species of Diatomæ.—*Silliman's Journal*, XXXV (1839), 118–124.

A sketch of the infusoria of the family Bacillaria, with some account of the most interesting species which have been discovered in the United

States.—*Silliman's Journal*, XLI (1841), 284–305; XLII (1842), 88–105; XLIII (1842), 321–332; American Geol. and Nat. Assoc. Repts. (1843), 112–164.

American Polythalmia from the Upper Mississippi, and also from the cretaceous formations on the Upper Missouri.—*Silliman's Journal*, XLI (1841), 400–401.

Yellow showers of pollen.—*Silliman's Journal*, XLII (1842), 195–197.

Notes on the infusoria of the Mississippi river.—Proceedings Boston Soc. Nat. Hist., II (1845–48), 33–35.

Notice of some new localities of infusoria, fossil and recent.—*Silliman's Journal*, XLVIII (1845), 321–343.

On the crystals which occur spontaneously formed in the tissues of plants [1843].—*Silliman's Journal*, XLVIII (1845), 17–32; Bibl. Univ. LVI (1845), 388–392; Froriep Notizen, XXXV (1845), col. 65–69.

On the detection of spirally dotted or scalariform ducts and other vegetable tissues in anthracite coal.—*Silliman's Journal*, I (1846), 407–410; Ann. Nat. Hist., XVIII (1846), 67–69.

Account of some new infusorial forms discovered in the fossil infusoria from Petersburg, Va., and Piscataway, Md.—*Silliman's Journal*, XLVI (1844), 137–142.

On some new species of American Desmidiaceæ from the Catskill mountains.—*Silliman's Journal*, I (1846), 126–127.

Notes on the algæ of the United States.—*Silliman's Journal*, III (1847), 80–86, 399–403; VI (1848), 37–42.

On a process for detecting the remains of infusoria, etc., in sedimentary deposits.—Proceedings Amer. Assoc. 1849, 409.

Some remarks on the Navicula Spencerii, and on a still more difficult test object.—*Silliman's Journal*, VII (1849), 265–270.

Discovery of an infusorial stratum in Florida.—*Silliman's Journal*, X (1850), 282.

Reply to Mr. de la Rue's remarks on the Navicula Spencerii contained in the *American Journal of Science*, vol. IX, p. 23: with a notice of two new test objects.—*Silliman's Journal*, 1851, 82–84.

Microscopical observations made in South Carolina, Georgia and Florida [1850].—Smithsonian Contributions, II (1851).

Microscopical examination of soundings made by the U. S. Coast Survey off the Atlantic coast of the United States.—Smithsonian Contributions, II (1851); *Edinburgh New Phil. Journal*, LI (1851), 359–361; LIV (1853), 142–144; *Silliman's Journal*, XII (1851), 132–133; *Journal Micro. Sci.*, III (1855), 89–91.

List of Diatomaceæ collected by the United States Exploring Expedition under Captain Wilkes.—Proc. Philadelphia Acad. Nat. Sci., VI (1852–53), 431–434.

Observations on a newly discovered animalcule.—*Silliman's Journal*, XV (1853), 341–347; *Journal Micros. Sci.*, I (1853), 295–299.

On a mode of giving permanent flexibility to brittle specimens in botany and zoölogy.—*Silliman's Journal*, XVIII (1854), 100–102; Ann. Nat. Hist., XIV (1854), 373–375.

Reply to some remarks by Mr. W. H. Wenham and notice of a new locality of a microscopic test object.—*Silliman's Journal*, XIX (1853), 28–30.

On a universal indicator for microscopes.—*Silliman's Journal*, XX (1855), 58–65; *Journal Micros. Sci.*, IV (1856), 55–62.

Notes on new species and localities of microscopical organisms [1853].—Smithsonian Contributions, VII (1855).

Remarks on Mr. Wenham's paper on aperture of object glasses.—*Silliman's Journal*, XXI (1856), 105–106; *Journal Micros. Sci.*, IV (1856), 160–162.

New method of detecting fossil Diatomaceæ.—*Silliman's Journal*, XXI (1856), 356–357.

On the non-existence of polarizing silica in the organic kingdom.—*Silliman's Journal*, XXI (1856), 357–358; Ann. Nat. Hist., XXIII (1856), 78–79; *Journal Micros. Sci.*, IV (1856), 303–305.

On some specimens of deep sea bottom from the sea of Kamtschatka.—*Silliman's Journal*, XXI (1856), 284–285.

Notice of microscopic forms found in the soundings of the sea of Kamtschatka.—*Silliman's Journal*, XXII (1856), 1–6.

On the origin of green sand and its formation in the oceans of the present epoch.—*Silliman's Journal*, XXII (1856), 280–284; Ann. Nat. Hist., XVIII (1856), 425–428; Proc. Boston Soc. Nat. Hist., V (1854–56), 364–368; *Journal Micros. Sci.*, V (1857), 83–87.

Report upon the result of microscopic examination of soundings made by Lieut. Berryman, of the U. S. Navy, on his recent voyages to and from Ireland in the "Arctic."—*Silliman's Journal*, XXIII (1857), 153–157.

The breadth and accuracy of Prof. Bailey's knowledge are manifest in all of these papers. A few of the titles seemingly foreign to any line of botanical research have been introduced because of the many references contained in the papers which they represent to work done in that direction. Many titles have been omitted altogether, because they only served to give evidence of his ability in the fields of chemistry and geology, and have no place in a sketch of the botanist, unless it be to increase our admiration for the scientist whose strength of mind and keenness of vision enabled him to be both deep and broad.

His work gained for him many tokens of honor and respect from his fellow-workers. At the time of his death he held the position of president of the American Association, and had he lived would have presided at the Montreal meet-

ing of 1857. Many species were dedicated to him, and a genus of the Compositæ commemorates his name. I extract the following from Plantæ Fendlerianæ, at page 105, as a fitting conclusion to this brief sketch, giving, as it does, the testimony of Dr. Gray as to the work and merit of Prof. Bailey. Dedicating Baileya, a new Composite genus of two species from the Texano-Arkansas district, he says: "This genus is dedicated to Prof. J. W. Bailey, of the U. S. Military Academy, who is particularly distinguished for his researches among the minuter algæ and especially the Diatomaceæ (which he was the first to detect in a fossil state in this country), for his microscopical investigations concerning the crystals contained in the tissues of plants, and for the detection of vegetable structure in the ashes of anthracite."

Purdue University, Lafayette, Ind.

A new water-lily.

THOMAS MORONG.

(WITH PLATE VII.)

Castalia Leibergi[1] n. sp. A diminutive water-lily with white odorless flowers about 1½ inches in diameter when fully expanded: sepals an inch long, narrowly obtuse, the nerves on the inner side very obscure: petals in two rows, a little shorter and more obtuse than the sepals, faintly striped with purple lines: stamens in 3 or 4 rows, running up the ovary slightly more than half-way: stigmatic rays 7 or 8, the projecting points very short and blunt: leaves oblong or oval, with a broad open sinus and obtuse lobes, varying in size from 2 to 4 inches long by 1¼ to 2½ inches wide, the veins on the lower surface sunken: petioles and peduncles smooth: rhizome and fruit not seen.

Judging from the length of stems on the specimens examined, the plant must grow in shallow water. It bears much resemblance to *Castalia pygmæa* Salisb., a plant found

[1] The writer is aware that in the present dispute regarding the nomenclature of our water-lilies he is likely to have his property appropriated by the other side whether he adopts the name in the text or calls the plant *Nymphæa Leibergi*, but believing in the "right of priority," both as to generic and specific names, he prefers to follow his own convictions of justice rather than ask which is the larger party in the controversy, or which carries the greater weight of authority.

in Siberia, China and Japan, but that has still smaller flowers, with acute sepals and petals, lobes of the leaves acute, and, according to Aiton, sunken veins in both surfaces of the leaf.

This pretty little addition to our water-lilies was collected by Mr. John B. Leiberg, June, 1887, in a small pond in northern Idaho, near Granite station, on the North Pacific Railway; "very local," as the collector writes, and the first of the genus discovered so far west.

Ashland, Mass.

BRIEFER ARTICLES.

A meeting of the German botanical society.—Among the numerous scientific societies of Germany the Deutsche botanische Gesellschaft holds a prominent place, and as the German botanical society *par excellence* it very properly has its headquarters in Berlin, where there are probably more botanists of reputation than any other city in the world can show.

The meetings are held in the botanical institute, which at present occupies a building immediately back of the university. On entering the lecture-room in which the members are assembled, we find it a most unpretending room, furnished in the most primitive style with clumsy wooden benches and desks that have evidently seen many generations of students, as is plain from the innumerable inscriptions and devices cut or scrawled upon them, for in this particular students are much the same on both sides of the Atlantic. At the front of the room, on a low platform, were chairs and desks for the chairman and secretary.

The meeting was called to order at about half-past six by Professor Schwendener. He is a man of about sixty, but does not look so old, being noticeably vigorous in appearance. He is of medium height, with a scholarly face framed in abundant, rather short iron-gray hair and beard.

The first thing on the programme was the election of members, and the proposing of new names.

Before proceeding to the business of the evening Professor Schwendener announced the death of three members, DeBary, Cienkowsky and Dr. Kroh, the latter name a new one to me. He dwelt especially upon the irreparable loss that science had suffered in the death of DeBary, and the very high position he held, not only as an investigator, but as a teacher. No botanist had had so many distinguished pupils, and no teacher was ever more looked up to. After concluding his remarks, all present rose in respect to the memory of the departed members.

The greater part of the meeting was occupied in the reading of abstracts of papers; the authors, when present, reading themselves, in other

cases the reading being done by some other member. Among the papers read was one by Tschirch on the development of resin-passages and similar secretion-reservoirs, which he illustrated by blackboard drawings. Professor Magnus read abstracts of two papers, one by Reinke on the brown algæ of the bay of Kiel, and another very interesting one by Schütt on the nature of phycoerythrin. Professor Kny spoke briefly of a paper by Dr. Müller (his assistant), who was unable to be present, on secretion-canals in the phloem of certain Umbelliferæ and Araliaceæ. There were other papers more or less interesting, but this will give some idea of their general character.

Among those present I noticed Professors Schwendener, Kny, Ascherson, Magnus, Wittmack, Frank, Drs. Tschirch, Potonié, Schumann, and numerous others whom I did not recognize. Pringsheim, who I believe is the president of the society, was not present, though I saw him at an earlier meeting. The ladies were represented by Miss Hallowell, of Wellesley, who at the urgent invitation of several members was present, and I fancy was about the first woman who has been thus honored, as you probably know the Germans have rather different ideas from ours in regard to the woman question. It was with some difficulty that Miss Hallowell could escape the friendly importunities of one or two of the members, who almost insisted that she should also take part in the supplementary meeting which most of the members held in a neighboring restaurant, where over a glass of beer questions are discussed in a more informal way than in the regular meeting.

Thus ended the January meeting of the Deutsche botanische Gesellschaft.—Douglas H. Campbell, *Berlin*.

Puccinia mirabilissima Pk.—While collecting in several of the western states and territories during the summer of 1887, this species was observed by the writers upon the leaves of Berberis repens in several localities. Not only were the uredo- and teleutospores found, but on several occasions an Æcidium which differs somewhat from the well known Æcidium berberidis was taken upon the same host.

The Æcidium was collected near the head of a small cañon at Flagstaff, Arizona. Although the host plants were plentiful, only an occasional affected leaf could be found. Careful search was made for Puccinia in the same locality, but none was observed. Half a mile distant, in the same cañon, an abundance of Puccinia mirabilissima was collected; the uredo stage being much more abundant than was the teleutoform, the latter being found only on leaves which were apparently two years old, while the former were found upon almost every young leaf examined. Careful search was made here for the Æcidium, but none was found.

On September 27, P. mirabilissima was found very abundantly in a cañon near Golden, Colorado, on its usual host, Berberis repens. The plants appeared thrifty and vigorous, but nearly every leaf was affected, and on

many at least half the under surface was covered by the dark brown sori. Hundreds of plants were examined, but not one was found free from the fungus. Care was taken to collect some of the oldest and most mature leaves, as well as some of the younger and fresher ones, but only an occasional teleutospore can be found on any. This, probably, may be accounted for from the fact that the Colorado specimens were taken at a time when they had several weeks more in which to complete their growth before being checked by frost, while the Arizona specimens were taken near the close of the long dry season, when the growth was completed, and the plant in a condition similar to that in which the Colorado plants would be at the beginning of the winter.

Whether this Æcidium is only a form of the well known barberry cluster cups or whether it is related to Puccinia mirabilissima remains to be proved by artificial cultures; we merely mention its occurrence in this connection as an interesting fact.

Our specimens give the following characters: Spots bright purple, 3-4 mm. in diameter, very slightly thickened: æcidia hypogenous, long, pale yellow, borders coarsely lacerated; spores subglobose, tuberculate, 15-20μ in diameter.—TRACY & GALLOWAY, *Washington, D. C.*

Abnormal Anemone and Convolvulus.— A description of two abnormal flowers may be of interest to the readers of the GAZETTE, as bearing upon morphology.

The first was a flower of Anemone dichotoma. Normally there are five white sepals, with an involucre some distance below the flower. This specimen had a sixth sepal outside of the others, but so close as to touch. It differed from the rest in that the upper half had the form and color of an involucral leaf, but much smaller. It was half sepal and half leaf.

In the second case the abnormity was deeper seated. A flower of Convolvulus sepium, the wild morning-glory, had four lobes of its large white corolla perfectly developed, but the fifth was about half as wide as it should be and entirely separate from the others. Four of the stamens were perfect, while the fifth, seemingly anxious to compensate for the imperfection of the corolla, was developed in a curious manner. It was placed opposite the point of detachment of the fifth lobe of the corolla; the filament was about the same length as the others, but broader and channeled. One lobe of the anther was fairly well developed, while the other, which was next to the imperfect corolla lobe, had grown into a petal. This portion, which was the exact color and texture of the corolla, was $\frac{3}{4}$ inch long, and $\frac{1}{4}$ inch wide at the top.—A. S. HITCHCOCK, *Iowa City, Iowa.*

A gift to Brown University.—About two years ago it was mentioned that Brown University had the promise of the large and valuable fern collection of the late William Stout, of New York. The promise has been fulfilled by Miss A. A. Stout, who gives the herbarium in the name of her

deceased brother and with the understanding that it shall be made available to students and public alike. A large part of the collection has been carefully mounted by the donor on sheets a good deal larger than usual (an advantage, perhaps, with ferns). In most cases there is much duplication, and generous display of material to illustrate geographical distribution. The collection is cosmopolitan. The following items give some idea of the scope of the bequest: Canada to Florida, New Mexico, Arizona and California (565 sheets); India and South India (537 sheets); Ceylon (228 species, 267 sheets); Jamaica (200 species); Trinidad (146 species); Sandwich Islands (100 species); New Zealand (nearly complete collection); New Caledonia, South Africa, Pacific islands and Madagascar (all very complete). Besides these, there are the herbaria of W. T. Atkinson (570 sheets, mostly North Indian ferns) and Dr. A. P. Garber (Phanerogams of Florida, 340 species). A valuable set of books, comprising the best of fern literature, also accompanies the plants.

It will thus be seen that Brown University acquires a collection of ferns almost as valuable as its fine set of Carices.—W. W. BAILEY, *Brown University.*

Death from eating Cicuta maculata.—Ann Arbor, Michigan, adds another to the already considerable list of poisonings due to this virulent plant. The mild days of last week melted the snow, brought back the birds, and induced a general spring time feeling, to which the children of a neighborhood on the outskirts of the city gave expression by digging and eating the artichokes that occur plentifully on some low ground bordering a brook. Two of these boys were soon taken violently ill, and the son of Julius Krueger, who was eight years old, died within an hour. The violent convulsions, marked dilation of the pupils, and other symptoms indicated some active vegetable poison. Search where the children had been digging brought to light a few suspicious branching tubers, somewhat resembling small dahlias. Their taste was quite suggestive of parsnips, and not particularly disagreeable at first, although less mild than artichoke. On cross section a yellow oily or resinous fluid exuded from a ring of glands in the cortex. No last year's stems could be found, but from the habit of growth, odor, taste, and general appearance of the tubers, and from some nascent leaves on the crown, there was little doubt to what plant they should be referred. A portion of the contents of the stomach of the dead boy afterward came into my possession, and microscopic examination showed the macerated fragments to be identical in structure with the tubers. Finally, an histological comparison with some dried tubers of Cicuta maculata preserved in the university herbarium completed the identification.

The extreme virulence of the poison may be inferred from the comparatively small amount of the tuber found in the stomach on *post-mortem*, and from the fact that the stronger boy, who vomited and recovered,

suffered from intermittent spasms more than four hours.—ERWIN F. SMITH, *Bot. Laboratory, Univ. of Michigan.*

An exchange club for Thallophytes.—The following official communication was received too late for the April number. It was sent in response to a suggestion by the editors of this journal that the arrangements being made to establish a botanical exchange club might well be extended to include the lower orders of plants, or else a similar but independent organization might be effected for that purpose, greatly to the advantage and convenience of many botanists:

SIRS: I am authorized by the Commissioner of Agriculture to say that the same arrangements made with the committee of the A. A. A. S. Botanical Club for facilitating exchanges of plants may be extended to include the thallophytes.

I shall take pleasure in carrying out the purposes intended.

Very respectfully, F. L. SCRIBNER,
Dept. of Agriculture, Section of Veg. Pathology.

Washington, D. C., March 31, 1888.

As the letter shows, Commissioner Colman, with much liberality, impartially extends the facilities of his department to further the interests of the several classes of collectors, and Prof. Scribner kindly offers to undertake the same supervision of the thallophytes that Dr. Vasey gives to the higher plants. It now remains with the botanists of the country to arrange and perfect plans to put the system of exchanges into successful operation.

EDITORIAL.

THE ADVANTAGES of an organization to facilitate the interchange of herbarium specimens are so numerous and so obvious as to require no argument. The wisdom of the Botanical Club of the A. A. A. S. in setting a scheme on foot for supplying the need of American botanists in this respect meets with general favor. Although not so specified in the reports of the club, and of its special committee yet it is evident that only flowering plants and vascular cryptogams were kept in view by the promoters of the plan. The number of collectors and students of fungi in the United States is large, and the advantages of securing systematic exchanges among them are quite as great, if not greater, than among collectors of higher plants. So far as we know, the matter has not been agitated; but, feeling the need of some such facilities ourselves, and thinking others might also, we took the initiative by securing the good offices of Commissioner Colman and Prof. Scribner, as stated in another part of this number. We hope the subject will be discussed by those who are interested, and plans developed for eventually putting the matter into successful operation. Whether it is best to have only one exchange

club, to be divided into two sections possibly, or to have independent organizations for the higher and lower plants, must be determined. The lack of a suitable printed check list of thallophytes for use in marking desiderata is an obstacle to be surmounted. The meeting at Cleveland will give a good opportunity for arranging details and perfecting an organization, especially if there has been discussion through the journals in the mean time.

THE PROCESS of imbedding in paraffin seems heretofore to have been looked upon as only suitable for tissues of considerable resistance. In both editions of Strasburger's *Botanisches Practicum* occurs the phrase "für etwas härtere und bedeutend härtere Objecte empfehlen sich .... und Paraffin." As the last edition was issued in 1887, it is not surprising, therefore, that the *Botanisches Centralblatt* published in June of 1887 an article by Dr. Schönland, of Oxford, giving details of a process for imbedding delicate objects in paraffin,[1] for there does not seem to have been any record of success in this direction previously. We have been informed, however (and in response to an inquiry Dr. Farlow confirms the statement), that for two years and a half advanced students in the cryptogamic laboratory at Harvard have successfully applied the zoölogical methods of imbedding to plants. Certainly, no one could have suspected this from the expressions in the papers published by two of these gentlemen. Mr. J. E. Humphrey in his paper on Agarum Turneri says:[2] "Although this seems hard treatment [*i. e.*, imbedding in paraffin and mounting in balsam] for an algal tissue, the tough, leathery character of the frond enabled it to withstand well, and very satisfactory results were obtained." In the next paper of the volume cited, "On the Morphology of Ravenelia glandulæformis," by Mr. G. H. Parker, p. 209, we read, "Moreover, the density of the imbedding material [paraffin] was such that it intensified the shriveling" [*i. e.*, the shriveling from drying, *herbarium material* being used].

Certainly, these are not expressions which would encourage one in the attempt to imbed *delicate* tissues! But we are very glad to give credit to these students, who, we are assured, used the process in all essential respects the same as that described in the January GAZETTE so long ago as the winter of 1885–6. Let it be borne in mind, however, that the essential features of Dr. Moll's results are perfect preservation of the protoplasmic contents, absolute freedom from shriveling and perfect penetration of the material by paraffin.

IT IS WITH PLEASURE we note the evident tendency of our systematic work. It is rapidly becoming more and more specialized, and hence is sure to become more and more critical. Not so very long ago, a systematic botanist who made any pretense to distinction was expected to be

[1] See abstract in this journal, xii (1887), p. 172.

[2] On the Anatomy and Development of Agarum Turneri.—Proc. Am. Acad., 1886, p. 202.

able to pass an infallible judgment upon any plant from Clematis to Quillwort. Fortunately, this day of smattering seems to be passing away, and systematists, even among phanerogams, are confining their attention more and more to certain groups. The consequence must be a more exhaustive study of these groups, an elaboration of all possible means of classification based upon minute as well as gross structures, a complete disentangling of synonymy, and establishing all claims of priority—in short, that detailed presentation of the subject which is necessary if systematic botany proposes to be a progressive science. Even now manuals are not the work of one man, and they will become less and less so, until the best manual will be a very composite affair in the matter of authorship. It is commonly supposed by the uninitiated that every botanist who is more or less well known can unerringly determine "off-hand" any plant that is presented to him. It would be far more comfortable for some botanists if the "uninitiated" could be made to understand that this is an entirely false supposition. Of course, there is a host of plants that every botanist knows, but such are not the ones most frequently thrust at him. He is called upon to decide upon critical cases—some species, for instance, in a difficult genus of most perplexing species. The confession might as well be made that every botanist, however well-informed, has to "dig out" all such plants from the books, and is in no case ready with an "off hand" opinion except in the group which he may just then be studying. A man may even have written a monograph, but presently he will have to use it in the determination of plants like any one else. There has been an astonishing amount of careless "off-hand" naming done by botanists whose names carry weight, and who blundered for the simple reason that they were not familiar with the subject. Specializing avoids all this, and critical points should always be submitted to some botanist who is paying special attention to the group. A botanist should no sooner think of sending a Composite to a man chiefly familiar with Carex than a zoölogist now thinks of sending a Sea-urchin to a specialist in Crustacea.

OPEN LETTERS.

Is the strawberry poisonous?

In reference to Prof. Prentiss' "open letter" under the above title (this volume, p. 19), the cases recorded are evidently pure idiosyncrasies, due not in the least to the peculiarity of the fruit, but to the peculiarity of the sufferer. The precise nature of these idiosyncrasies is very obscure, but they are certainly not due to mental influences, and the interesting circumstance that in the first case the rash always commenced *behind the ears* is evidence that irritation was caused to the ends of the pneumogastric nerve, which is connected with the skin only by a twig

supplying the tissue at the back of the ear. A similar case has been reported to me on excellent authority, and is corroborated fully by the sufferer himself, of a rash being invariably developed in a boy after eating oatmeal, but in this instance it was unaccompanied by any alarming symptoms. A somewhat different case of idiosyncrasy is recorded in *The Lancet* (February 28, 1888, p. 394), in which a negro woman in Barbadoes experienced the most alarming symptoms after an ordinary dose of cocaine.

THEO. D. A. COCKRELL.

West Cliff, Colorado.

Botanical expedition to S. America.

As various inquiries are made in regard to the botanical expedition to South America which I am contemplating, I feel at liberty to say a word in this public way about the matter.

The plan is to start at Buenos Ayres, in the Argentine Republic, ascend the Paraguay and Parana rivers as far as possible, and to collect the water and land plants in the surrounding region along the southern boundary of Bolivia and southwestern boundary of Brazil.

Attempts will be made to explore the tributaries of the great water system which empties through the Rio de la Plata into the Atlantic. Subsequently the Argentine Republic will be crossed westerly to the Andes, and a visit made to Chili, with attempts to collect the little known flora of the desert of Atacama.

Of course, these plans are liable to be modified by circumstances, but it is hoped that a large and rare collection of the South American flora of the regions visited may be made and brought home to enrich the herbaria of our country.

If further information as to the disposal of the sets collected is desired, letters may be addressed to the writer up to the 1st of June next, or to Dr. N. L. Britton, of Columbia College, New York.

Ashland, Mass. THOMAS MORONG.

Report of the U. S. Mycologist for 1887.

Into the portion of this report which concerns California several errors have crept that are to be regretted. All the fungi mentioned as having been observed for the first time in California exist in my herbarium, from numerous localities. Uromyces Betæ and Puccinia prunispinosæ were collected by me in 1876, and are included in *Cat. of Cal. Fungi*, published as long ago as 1880. Peronosporia viticola, an account of which, with some localities, was given in *Bull. Cal. Acad.*, No. 7, June, 1887, abounds in California on our wild vine, Vitis Californica, and the denial of its existence by the U. S. mycologist will be productive of very mischievous results if it prevents our vine growers from taking measures to protect themselves from this dreaded pest already in our midst.

San Francisco. H. W. HARKNESS.

To the members of the Botanical Club of the A. A. A. S.

Your committee, appointed in August last, to devise a method for the exchange of specimens among American botanists, have, after consultations with other botanists, decided that the most practical method is through the herbarium of the Department of Agriculture at Washington.

A classified stock of duplicates belonging to the department is available as a basis of an exchange herbarium.

Those desiring to exchange specimens should address, for rules and other information, Dr. Geo. Vasey, U. S. Dep. of Agriculture, Washington, D. C.

Geo. Vasey, Sereno Watson, N. L. Britton, Thos. Morong, B. D Halsted, *Committee.*

CURRENT LITERATURE.

The families of plants.

The rapid advance in our knowledge of plants which has come from the wonderful development in appliances seems to demand a new general presentation of the plant kingdom. For the Phanerogams this is being undertaken in a masterly way by Drs. Engler and Prantl,[1] under whose editorship the best specialists are at work upon various groups of plants. The illustrations are abundant and most excellent, while the text is all that could be desired. The publisher is to be commended, not only for the handsome typography, but also for the very low price, which puts this invaluable work within the reach of almost every botanist. It appears in separate numbers, which come rapidly enough, but which hold no special relation to each other. Thus far the only completed parts are the second, fourth and fifth of the second volume, although several other numbers belonging to incompleted parts have appeared. A full discussion of the literature and anatomy of each family precedes the presentation of their classification, which includes the genera. Volume II, Part 2 (in 3 numbers), contains the *Gramineæ* by E. Hackel and the *Cyperaceæ* by F. Pax. Of the grasses 12 tribes are recognized, and 315 genera. In Cyperaceæ there are 65 genera, Carex being said to contain more than 500 species. Volume II, Part 4 (in 2 numbers), is more varied in its nature, containing several small groups, as follows: *Flagellariaceæ* (3 genera), *Mayacaceæ* (1 genus), *Xyridaceæ* (2 genera), *Rapateaceæ* (6 genera), and *Philydraceæ* (3 genera), by A Engler; *Restiaceæ* (19 genera), *Centrolepidaceæ* (6 genera), and *Eriocaulaceæ* (6 genera), by G. Hieronymus; *Bromeliaceæ* (40 genera), by L. Wittmack; *Commelinaceæ* (25 genera), and *Pontederiaceæ* (6 genera), by S. Schönland. Volume II, Part 5 (in 4 numbers), contains *Juncaceæ* (7 genera), by F. Buchenau: *Stemonaceæ* (3 genera, among which is our Croomia), *Liliaceæ* (198 genera), by A. Engler; *Hæmodoraceæ* (9 genera), *Amaryllidaceæ* (71 genera), *Velloziaceæ* (2 genera), *Taccaceæ* (2 genera), *Dioscoreaceæ* (9 genera), and *Iridaceæ* (61 genera), by F. Pax. The Smilaceæ are included under Liliaceæ, while *Androstephium* Torr. is re-

[1] Engler, A., and Prantl, K.—Die natürlichen Pflanzenfamilien nebst ihren Gattungen und wichtigeren Arten insbesondere den Nutzpflanzen. Volume II, Parts 2, 4 and 5. 8vo. Copiously illustrated. Leipzig: Wilhelm Engelmann, 1887. Subscription price M 1 50.

ferred to the Mexican *Bessera* Schult., *Hesperanthes* Baker to *Anthericum* L., *Hastingsia* Watson to *Schoenolirion* Torr., *Oakesia* Watson to *Uvularia* L., and *Prosartes* Don. to *Disporum* Salisb.

Adaptations to pollination.[2]

New methods of pollination are by no means readily discovered today, especially in so well-explored a field as Europe; but many details remain to be worked out, even in some of the best understood species, and the varying adaptations of the same species in separate localities, and the different behavior of their visitors under different conditions, still offer profitable occupation for good observers. The paper before us deals with some of these minor questions, relating to 176 species of the Giant Mountains of Germany.

Perhaps the most generally interesting part of the work is that relating to the Umbelliferæ, represented by 36 species. In volume vii of the GAZETTE attention was called to the seeming protogyny of *Erigenia*, *Sanicula*, and one or two other genera of this group, although some hesitancy was felt about accepting this as fully demonstrated. In a number of species studied by Schulz the styles are well developed when the flowers open, but the stigmas are said to be really unreceptive in the early stages of blooming in all of these apparent cases of protogyny. Yet, while truly protogynous Umbelliferæ appear to be still unknown (with the doubtful exception of *Erigenia*), the number of synacmic species is considerably increased. One is also struck by the large proportion in this list of Umbellifers with staminate flowers in addition to those that are hermaphrodite. The rudimentary umbellet of red flowers in the common carrot (present in only about one-sixth of the individuals examined) has proved quite as serious a puzzle to this observer as to others, whose explanations, however, are not satisfactory to him.

Much of the remainder of the paper is taken up with useful notes on the different forms of flowers in species of Caryophyllaceæ and Labiatæ, but nothing essentially new in principle is added. The part actually played by insects in pollination is brought in for very little comment, though some care has evidently been given to this class of observations.—W. T.

De Bary on bacteria.

The literature of bacteria is increasing with astonishing rapidity, both in the form of magazine articles and pamphlets and of bound volumes. Among all this array of facts and opinions, put together with multiplicity of details and bewildering uncertainty as to the relative credence to be accorded the various authors, the task of forming a well balanced and serviceable conception of the present state of the science of bacteriology

[2] SCHULZ, AUG.—Beiträge zur Kenntniss der Bestäubungseinrichtungen und der Geschlechtsvertheilung bei den Pflanzen. (Bibliotheca Botanica, Heft 10.) 104 pp. 1 pl. Cassel: Theodor Fischer, 1888.—M. S.

is well-nigh insurmountable for all but a few specialists. To have one in whom the utmost confidence can be placed go over all the ground, and carefully state the main facts with their true perspective--in short, to bring out a satisfactory orientation of the subject, using simple and attractive language, is a much needed service. It is no less than this that De Bary, whose recent death has been so great a loss to the scientific world, has done in the publication of his lectures under the title, *Vorlesungen über Bacterien*. This work, issued in 1885, met with an extended sale, calling for a second edition the following year. Another year saw it in English dress,[3] being translated by Mr. Garnsey, and revised by Prof. Balfour, who have been associated in giving us excellent English versions of several other standard German works.

An extended notice of the first German edition was given in this journal for May, 1886, which makes it unnecessary to occupy much space at this time. The work is remarkably clear in expression, concise and masterful in the selection and arrangement of subject matter, and has been put into an attractive and handy form by the publishers. It is specially noteworthy that the English volume in form and size is more satisfactory than, and in other respects quite equal to, the German, which is good fortune that rarely accompanies the translation of botanical works.

Instead of enumerating the various topics treated, it will suffice to say that the work gives a view of the whole field of the science, with particular, although brief, treatment of many of the more prominent and debatable questions, and a special examination of the relation of bacteria to fermentations and other chemical changes, and to the production of disease in plants and animals. A valuable bibliography and an index complete the volume.

Minor Notices.

THE "CENTRAL EXPERIMENTAL FARM" of the Department of Agriculture of Canada devotes its third bulletin[4] to the smuts attacking wheat and remedies for the same. Tilletia caries, T. lævis and Ustilago carbo are described and figured. Copper sulphate solution, strong brine and a weak alkali are recommended as preventives when applied to the seed wheat before sowing

MISS NEWELL has prepared a very useful series of outlines of lessons in botany,[5] which is now being issued in parts. The lessons outlined are intended for children 12 years old and upward. They follow the order

[3] DE BARY, A.—Lectures on bacteria; second improved edition. Translated by Henry E. F. Garnsey, M. A.; revised by Isaac Bayley Balfour, M. A., M. D., F. R. S. 193 pp., 20 wood engravings, 12mo. Oxford: Clarendon Press, 1887. [Macmillan & Co., New York.]

[4] FLETCHER, JAMES—Smuts affecting wheat (Bull. III, Cent. Exp. Farm), pp. 15, fig. 7. 8°. Ottawa, Dep't of Agriculture, Mch. 15, 1888.

[5] NEWELL, JANE H.—Outlines of Lessons in Botany, for the use of teachers or mothers studying with their children. Parts 1—4. Square 12mo. [Cambridge, Mass.: the author.] Printed at the Salem Press, Salem, Mass.

of Dr. Gray's "Lessons" and "How Plants Grow," and are designed to be used in connection with these books. No doubt they will prove very suggestive to teachers of the little folks. Certainly, the subjects they treat are much more suitable pabulum for youngsters than the histology proposed by Mrs. Knight in her "Primer of Botany."

DR. GRAY'S last Contribution[6] is before us, being a continuation of one in the last volume of the *Proc. Am. Acad.* it contains his notes upon the Rutaceæ, and only the beginning of Vitaceæ. Cneoridium is restored to Rutaceæ on account of its glands. Xanthoxylum is shown to be proper, and not Zanthoxylum. Amyris (formerly in Burseraceæ) is transferred to Rutaceæ, and a new species from Texas described. The only thing touched upon under Vitaceæ is Ampelopsis, which Dr. Gray retains as a genus, with A. quinquefolia as the type, thus not accepting Planchon's Parthenocissus, nor his definition of Ampelopsis.

NOTES AND NEWS.

PROF. THOS. C. PORTER sails for Europe May 26.

DR. J. PANCIC, of the Botanic Gardens of Belgrade, died March 8, at the age of seventy four years.

PROF. B. D. HALSTED has an interesting paper in the *Popular Science Monthly* (April) upon "California dry-winter flowers."

DR. PRANTL, called to the Eberswald school of forestry to succeed Dr. Luerssen, has declined, and will remain at Aschaffenburg.

THE ANNOUNCEMENT of the Shaw School of Botany for 1887–8 shows an attendance of 43 special students during 1887—26 in the spring and 17 in the fall.

NEW SPECIES of North American Phanerogams are described by Dr. N. L. Britton in *Bull. Torr. Club* (April), chiefly Cyperaceæ, together with critical notes upon certain noteworthy species.

THE FORESTRY DIVISION of the Department of Agriculture has issued a short circular on methods of increasing the durability of timber whose admonitions would be of value to wood consumers—if they would heed them.

PROF. E. L. GREENE, continuing his bibliographical notes in *Bull. Torr. Club* (April), replaces *Gleditschia monosperma* Walt. by the prior *G. inermis* Mill; and the western *Hesperochiron Californicus* Watson by *H. nanus* Lindl.

THE RUMOR that Dr. Graf zu Solms-Laubach was to succeed Dr. De Bary at Strasburg is confirmed. He has declined the call to Berlin, and will enter upon his work at Strasburg at the beginning of the summer semester.

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[6] GRAY, ASA.—Notes upon some polypetalous genera and orders. Proc. Am. Acad. XXIII, pp. 223-227. Issued April 19, 1888.

A. A. CROZIER, assistant botanist to the U. S. Department of Agriculture, has been appointed botanist to the state experiment station at Ames, Iowa, and has already entered upon his duties.

THE REPORT of the botanical section of the Philadelphia Academy of Sciences for 1887 shows that the collection contains 27,267 species of phanerogams and ferns, over 1,000 of which were added during 1887.

DR. J. C. ARTHUR sails from New York May 16, and intends visiting the principal universities and experiment stations in England, Holland and Germany, returning in time for the A. A. A. S. meeting in Cleveland.

DR. H. FREIHERR VON BRETFELD, professor of botany at the Polytechnikum of Riga, died in February, at the age of thirty-five years. He published an excellent work on the physiology of plants in relation to agriculture in 1884.

THE KEW BULLETIN for March contains seven numbers, as follows: Forsteronia rubber, Patchouli, W. African indigo plants, Vanilla (with plate, illustrating its fertilization), Streblus paper, Urera fibre (with plate of U. tenax), and Tea.

PROF. B. D. HALSTED is writing a series of five articles for the *Chautauquan*, under the following titles: (1) Seeds, and how they travel; (2) The unfolding of plant life; (3) Plants at work; (4) Flowers and fruits; (5) Flowerless plants.

AN INTERESTING article on the position of the roots of plants under field culture and their relation to moisture and cultivation is given by E. S. Goff in the last number of the Proceedings of the Western New York Horticultural Society.

A LIST of fungi which occur upon different cultivated fruits has been published by Baron von Thümen, under the title *Pilze der Obstgewächse*. The species found on the several parts of the plant are grouped alphabetically. There are over 4,200 kinds enumerated on 77 different hosts.

A LAW to make the destruction of barberry bushes obligatory in France, Spain, Italy and Switzerland, except for ornamental purposes in gardens and parks, on account of the æcidium promoting the increase of wheat rust, is being urged by the French National Society of Agriculture.

THE MEMORIAL pamphlet published by the University Press at Cambridge in honor of Dr. Gray contains the funeral sermon by Rev. A. McKenzie, order of funeral services, selections from the Bible read by Rev. Dr. Peabody, remarks by Dr. McKenzie, and an address by Dr. Peabody.

A LIST of 170 species of plants collected by Miss Mary B. Croft, in 1884–85, in western Texas, named by Drs. Britton and Rusby, is published in Transactions of the New York Academy of Sciences for 1887 (VII, p. 7), containing the description of one new species. This is a white-flowered Houstonia, H. Croftiæ, growing but an inch high. Some minor changes of nomenclature occur in the list.

ONE OF THE most thoroughly satisfactory illustrations of fungi we have ever seen is a photo-print of Boletus luteus tinted by hand in water-colors, illustrating an article on the use of photography for the larger fungi, by M. Bourquelot in the *Bulletin Soc. Mycologique de France* (III, p. 185) for 1887. The character of the pores on the under surface is brought out with marvelous softness and fidelity.

PROF. L. H. BAILEY, JR., of the Agricultural College of Michigan, has accepted the chair of horticulture in Cornell University, and of horticulturist to the agricultural experiment station, at a salary of $3,000 a year, with a year's leave of absence to visit Europe at such time as he may select, without interruption of salary. He remains in Michigan until August.

A REVISION of the genus Doassansia, by Dr. J. B. DeToni, of Padua, Italy, is given in the current number of the *Journal of Mycology*, page 13. Eleven species are admitted, characterized in Latin, with full synonymy and additional notes. These species are exclusively American, while two others also occur in the United States. The bibliography contains titles of twenty-six articles and nine exsiccati.

THE POSITION and value of botany in agricultural experiment stations is broadly and suggestively treated by Dr. B. D. Halsted in *Agricultural Science* for March. The physiological, structural, systematic and pathological aspects of the subject are duly considered, and stress is laid upon the necessity of familiarizing the public with the fundamental facts of the science by means of carefully written bulletins.

THE *Journal de Botanique*, under the direction of M. Louis Morot, continues its second year with increased interest. A catalogue of Parisian plants, by Cornuti, is running through the numbers, while the following titles show the general nature of the papers: The Mutisiaceæ of Yun-Nan (with plates of new genera and species), by Franchet; The periderm of Leguminosæ, by Douliot; Nuclear and cell-division, by Strasburger; Herborisations about Montpellier, by Flahault; The fruit of Solaneæ, by Garcin.

THE PATHOLOGY of pollen in hay-fever is discussed by Prof. Samuel Lockwood in *Jour. N. Y. Micr. Soc.* (April). A plate shows the pollen of Ambrosia and Solidago, and four possible modes of action for pollen in hay-fever are given, as follows: (1) Its suffocating effect as an impurity of the atmosphere, thus exciting asthma; (2) as a mechanical irritant, begetting inflamation, even to excoriation of the mucous membrane; (3) as a toxic agent, poisoning the tissues; (4) as a pseudo-parasite, penetrating the soft and sensitive parts.

THE RESISTANCE of pollen to external influences was the subject of a recent inaugural address by Herr Rittinghaus at Bonn (*Naturf.* 1, 1888). In the matter of temperature, 104.5° C. for 10 minutes was found to be the maximum for germination. A moderate temperature (32° C.) is favorable to the development of pollen tubes, while low temperature (under 9° C.) prevents germination. Vapor of chloroform for 20 min. was fatal, bromine vapor in 5 min., and ammonia in 10 to 20 min. The retention of the power of germination differs widely in plants, but the average is 30 to 40 days.

AT A RECENT MEETING (Feb. 16) of the Linnæan Society Mr. H. N. Ridley read a paper on self-fertilization and cleistogamy in orchids. The common methods of self-fertilization were described as follows: (1) By the breaking up of the pollen mass, and falling of the dust either directly upon the stigma, or into the lips, whence it comes into contact with the stigma; (2) by the falling of the pollen masses as a whole from the clinandrum into the stigma; and (3) by the falling forward of the pollinia from the clinandrum, or the anther cap, the caudicle and gland remaining attached to the column.—*Nature* (March 8).

BOTANY is strongly represented in the organization of the Tennessee experiment station. Prof. F. Lamson Scribner, at present chief of the section of vegetable pathology of the U. S. Department of Agriculture, is placed in charge of botany and horticulture, and also made professor in the university; W. E. Stone, now studying at the University of Göttingen, and well known to our readers as a contributor of articles on physiological botany is made chemist; and Prof. C. S. Plumb, of the university, and editor of *Agricultural Science*, who has made practical studies of cultivated plants and their diseases, is assistant director.

ILLUSTRATIONS of the dispersion of seeds and plants by way of the alimentary canal of various animals are given in *Nature* (March 15) by Mr. D. Morris. Pithecolobium Saman, a large and important leguminous tree, was introduced into Jamaica from Venezuela by means of cattle. The legumes were fed to the cattle during the voyage, and the seeds were voided free from the pod, and so much softened as to rapidly germinate. The tree was thus introduced by the very animals that required it most for shelter, shade and food. In India the Acacia arabica, or babul, is regularly induced to speedy germination by feeding babul leaves and pods to flocks of goats. In St. Helena they dare not use "urban" manure because the land would become overrun by prickly pear (Opuntia Ficus-Indica), the fruit of which is largely consumed by the inhabitants.

SKETCHES of the life and labors of Dr. Asa Gray are numerous, but no one that has reached us is more appreciative and judicious than that by Dr. J. D. Hooker, in *Nature* (Feb. 16). The opening paragraph gives us the place of our botanist in a new and very suggestive way: "When the history of the progress of botany during the 19th century shall be written, two names will hold high position, those of Prof. Augustin Pyrame DeCandolle and Prof. Asa Gray. In many respects the careers of these men were very similar, though they were neither fellow countrymen nor contemporaries, for the one sank to his rest in the Old World as the other rose to eminence in the New. They were great teachers in great schools, prolific writers, and authors of the best elementary works on botany of their day. Each devoted half a century of unremitting labor to the investigation and description of the plants of continental areas, and they founded herbaria and libraries, each in his own country, which have become permanent and quasi national institutions. Nor were they unlike in personal qualities, for they were social and genial men, as active in aiding others as they were indefatigable in their own researches; and both were admirable correspondents. Lastly, there is much in their lives and works that recalls the career of Linnæus, of whom they were worthy disciples, in the comprehensiveness of their labor, the excellence of their methods, their judicious conception of the limits of genera and species, the terseness and accuracy of their descriptions, and the clearness of their scientific language."

DR. A. F. W. SCHIMPER has published an exceedingly interesting and valuable paper[1] upon the formation of calcium oxalate in foliage leaves and the *rôle* of calcium salts in the plant economy. The subject has long attracted investigators, and the literature is, therefore, quite extensive. Schimper finds calcium oxalate crystals in small quantities formed in leaves during their growing period, which he calls *primary*, and whose formation is not taken into account. The *secondary* calcium oxalate, however, occurs widely distributed in plants and in very considerable quanti-

[1] Bot. Zeit., nos. 5 to 10, 1888: Ueber Kalkoxalatbildung in den Laub-blättern.

ties. It is formed after the leaves have ceased growing, and its formation is directly dependent upon light, the presence of chlorophyll and transpiration, but is *not* related to the assimilation of carbon. It is shown that calcium oxalate can pass from one cell to another. This fact, together with those just cited, renders it probable that it is formed in the green cells and then passes to others more or less empty, where it crystallizes. He further shows that nitrate, sulphate and phosphate of calcium exist in leaves quite generally, particularly in the parenchyma of the veins and that neighborhood, where these substances seem to be stored. These salts are split up *by the green cells under the influence of light* and the nitrogen, sulphur and phosphorus used in the manufacture of proteids, while the calcium combines with oxalic and perhaps carbonic and other acids. The resulting salt is to be looked upon in this case as a by-product of nitrogen-assimilation, etc. But the calcium salts are shown to have another and quite important *rôle*, namely, to promote the translocation of the starch produced by carbon assimilation. Plants grown in calcium-free solutions accumulated starch in the green cells while the tissues in which it is ordinarily conducted away remain quite free from it. Moreover, under these conditions the epidermis of the plants used, which contained large leucoplasts, had very little starch gathered about them, while the green cells below and even the guard-cells were gorged with it. It would seem indisputable that the presence of calcium was indispensable for the transfer of starch. Schimper does not deny that the formation of proteids from inorganic materials may take place in other parts of the plant, as in meristem. Nor does he consider that the formation of proteid by fungi militates against his conclusions. The nitrogen-assimilation of fungi, he says, appears to depend upon entirely different chemical process from those in green plants.

CARL DÜNNENBERGER has published[2] an account of his critical researches upon the lightening of bread dough. The paper is a long and able one. His most important result is the showing that "the normal fermentation of bread is alcoholic, whether one uses yeast or leaven[3] to render it porous." The only essential ferment organism is the yeast. Maltose, the substance fermented, is produced from a part of the starch of the flour by the action of a diastatic enzyme, *cerealin*. Bacteria are, as far as normal bread-fermentation is concerned, an impurity, and are absolutely unnecessary. The raising of bread dough depends, in the first place, upon the carbonic acid set free by the alcoholic fermentation. Afterward there is, in consequence of the temperature of the oven, an expansion of or volatilization of various substances which assist the raising action, namely, air, alcohol, water and (in an accessory, subordinate way) the volatile fatty acids formed by bacteria." Wigand's Bacterium farinaceum and Laurent's Bacillus panificans are thus thrown overboard, as far as their physiological action is concerned, and our light breads, whether by "salt-rising" or "Fleischmann's," depend on some budding saccharomycete.

DR. WILLIAM TRELEASE will sail for Europe early in June.

DR. GEORGE L. GOODALE has been appointed "Fisher Professor of Natural History" by the corporation of Harvard University.

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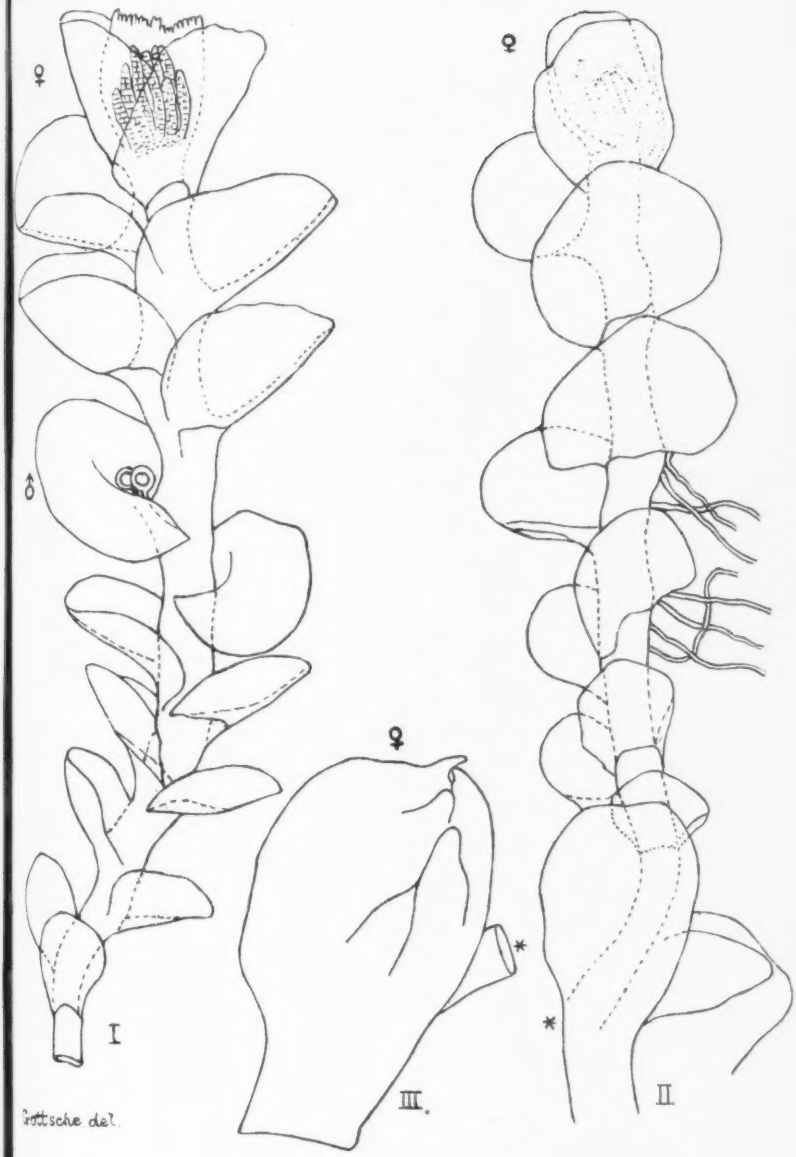
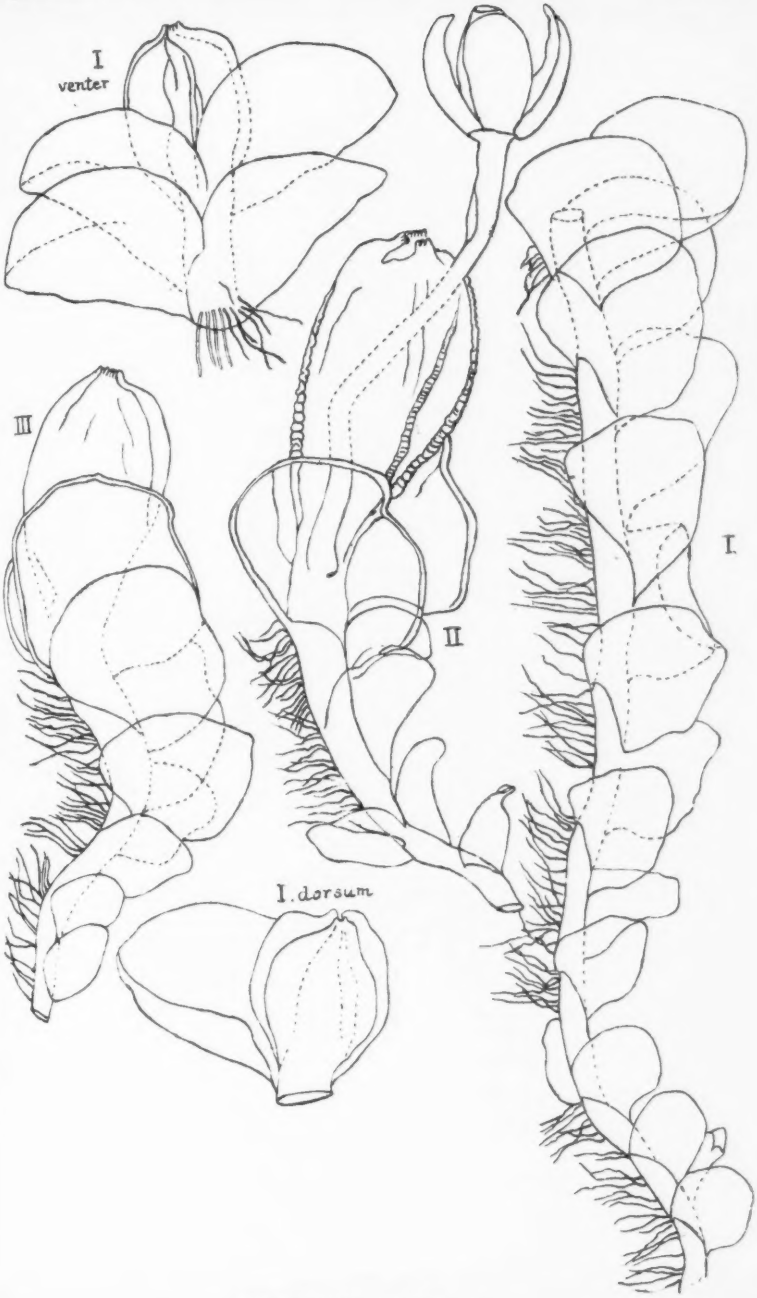
[2] Bot. Centralblatt, no. 8, 1888, p. 245 et nn. seq.: Bacteriologisch-chemische Untersuchungen über die beim Aufgehen des brotteiges wirkenden Ursachen.

[3] *I. e.*, dough left from one baking to another, either with or without the addition of an extract of hops or malt.



Gottsche del.

JUNGERMANIA DANICOLA, n. sp



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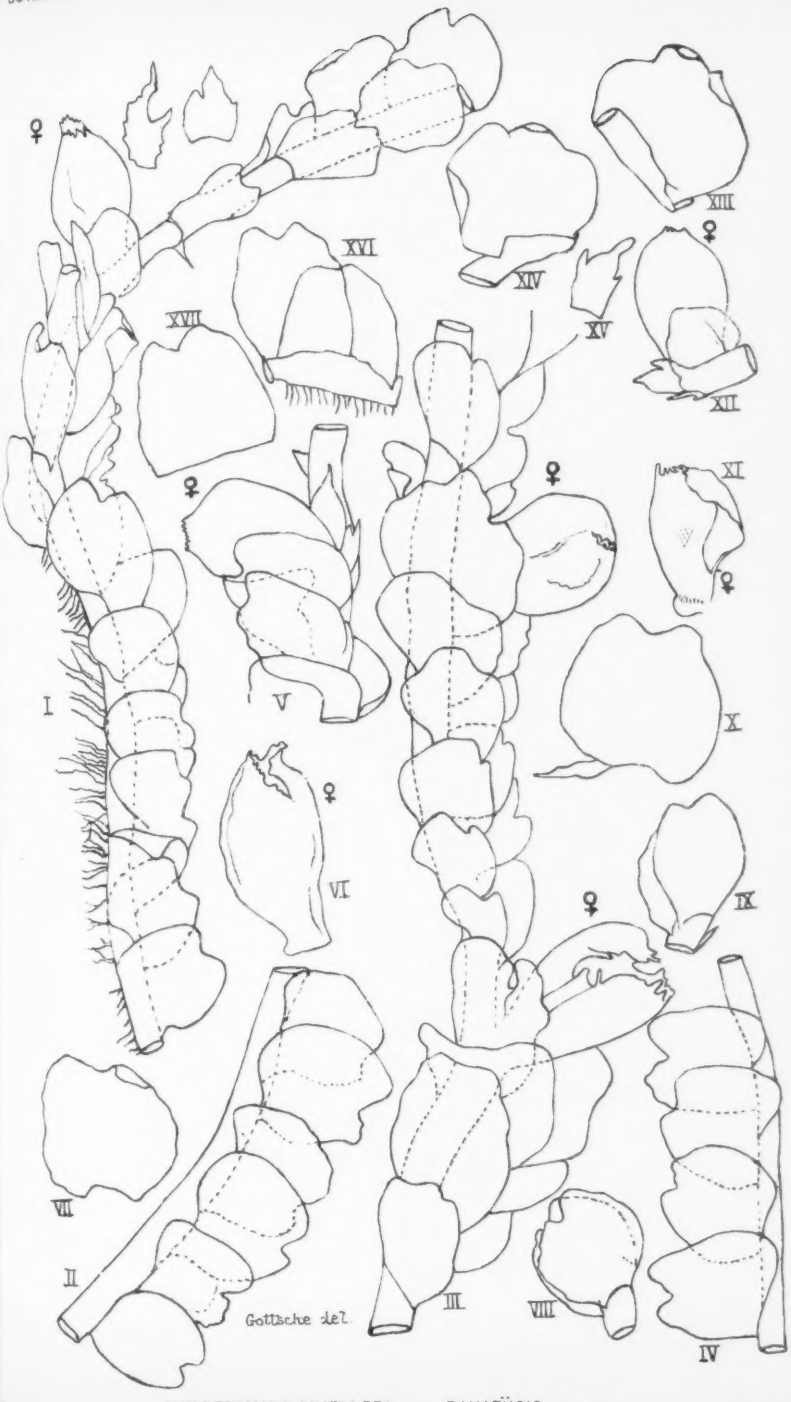

JUNGERMANIA MUELLERI, var. DANAËNSIS, n. var.

CASTALIA LEIBERGI, n. sp.